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WIPER BLADE FOR CLEANING MOTOR VEHICLE WINDOWS

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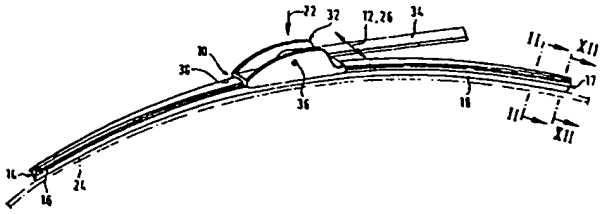
The following information is taken from materials supplied by the applicant.

A wiper blade is proposed, that serves to clean the windows of motor vehicles. The wiper blade has a band-shaped, long, flexibly elastic supporting member (30) on one flat side of which-the side facing away from the window (24)–there is a device (32) for connecting a powered wiper arm (34) that swings back and forth, and on the other flat side of which – the side facing toward the window-there is a long rubbery-elastic wiping strip (17) that is parallel to the longitudinal axis and can be laid against the window (24); and during the wiping operation the wiper arm moves the wiper blade perpendicular to its longitudinal axis, in the course of which the supporting member moves in a plane that is essentially parallel to the window surface. A reliable and quiet turnover of the wiping lip belonging to the wiping strip from one dragging position into another is achieved if, in each of the two swing directions (12, 16) [sic; (12, 26)], seen perpendicularly to the window, a straight line (38) through the longitudinal center of both

ends of the wiper blade lies, in the respective wiping direction, behind the center (40) of the point of connection between the wiper arm (34) and the wiper blade (10).



Description

State of the art

In wiper blades of the type specified in the generic terms of Claim 1, the supporting member is supposed to ensure, for the entire wiping field wiped by the wiper blade, a proper distribution on the window of the wiper blade contact pressure that originates from the wiper arm. By means of a corresponding curvature in the untensioned supporting member – that is, when the wiper blade is not in contact with the window-the ends of the wiper strip which is fully pressed against the window during use of the wiper blade are pressed toward the window by the supporting member which is then under tension, even if the radius of curvature of the spherically curved vehicle windows changes with every position of the wiper blade. So the curvature of the wiper blade toward the window must be somewhat more acute than the most acute measured curvature of the window in the area that is to be wiped. The supporting member thus replaces the costly yoke construction with two spring rails on the wiping strip, as is used in conventional wiper blades (DE-OS 15 05 357).

The invention is based on a wiper blade of the type in Claim 1. In one known wiper blade of this kind, known as a windshield wiper or wiper blade (EP-PS 0594451), the supporting member is formed by a spring rail, on the window-facing surface of which is glued a wiper blade that essentially corresponds to the wiping strip according to the invention. The supporting member of this wiper blade distinguishes itself due to its high lateral rigidity, which is supposed to prevent rattling noises that result from unstable operation. Yet these types of wiper blades present noise problems when in the reversal positions.

For an understanding of this problem, reference is made particularly to Figures 2 through 4, which are meant to clarify the behavior of the wiper blade during its back and forth wiping or working motion. When the wiper blade 10 has completed its motion in the one direction, shown in Figure 4 by the arrow 12, that is, when it has reached its reversing position, its wiping lip 18, which is connected to the body of the wiping strip 16 by a narrow flexing strip 14, is, relative to the body of the wiping strip 16, in a dragging position, which is indispensable for a good wiping result and quiet operation. In this position, the wiping lip 18 is propped, at 20, against the body of the wiping strip 16 with one long edge so that the contact pressure (arrow 22) acts upon the wiping lip 18 and the window 24 to be wiped. Then, when the reverse motion is begun (arrow 26 in Figure 3), the wiping lip 18 must, for the reason given, be turned from its one dragging position (Figure 4) that [sic; into] the other dragging position (Figure 3). In this process the wiping lip 18 at first stays fixed in the location it has attained relative to the window 24, so that the wiper blade momentarily attains a position as shown in Figure 2, before the wiping lip 18 tips into its other dragging position, shown in Figure 3. Only then does the actual wiping motion of the wiper blade 10 and the wiping lip 18 relative to the window 24 begin. The turning of the wiper lip 18 from its one dragging position (Figure 4) into the other dragging position (Figure 3) is thus associated with an up and down movement (double arrow 28 in Figures 3 and 4) of the wiper blade 10, the highest position of which is shown in Figure 2 and is attained at a mid-point between the two dragging positions. This up and down movement is carried out suddenly and simultaneously along the entire length of the wiping strip 14, 16, 18. This sudden flipping over produces a considerable, annoying knocking sound.

Advantages of the invention

In the wiper blade according to the invention with the identifying characteristic elements of Claim 1, during the turnover of the wiping lip from its one to its other dragging position and until the beginning of the actual wiping work along the entire length of the wiping lip, a so-called idle motion is required, through which the center of the connection point is brought ahead of the straight line in the respective wiping direction. During this idle motion – in which the ends of the wiper blade preferably remain fixed – the change of the dragging position of the wiping lip shown by Figures 2 through 4 begins from the middle area of the wiper blade and proceeds continuously, until the new required dragging position is achieved along the entire length of the wiping lip and the actual working motion of the wiper blade begins. Since the turnover process of the wiping lip is begun from its middle area and proceeds from there gradually and continuously to its two ends, the instantaneous flipping over of the wiping lip from its one into its other dragging position is avoided and thus the annoying knocking sound also does not occur. In this it is helpful, yet not absolutely necessary, if one or both ends are not moved in the new

wiping direction until the entire wiping lip has been turned over into the new dragging position. It is essential that at least one end stays behind relative to the wiping motion until the turnover of the wiping lip into the new dragging position has begun at at least one point.

This effect can be particularly reliably achieved if the distance of the straight line from the center of the connection point is greater than 1 mm.

Manufacturing advantages result from the fact that the thickness of the supporting member is constant along its entire length.

According to a first embodiment of a wiper blade according to the invention, the width, measured in the wiping direction, of the supporting member is smaller at its end areas than at its middle area. This makes it possible to influence the cross-section of the supporting member in such a way that simply the friction present during the wiping operation between the wiping lip and the window on the one hand and the force of the powered wiper arm that acts on the wiper blade on the other hand cause a deflection of the two end areas of the supporting member within the plane of motion of the supporting member in the opposite direction of the respective wiping direction, due to which the straight line passing through the longitudinal center of both of the ends of the supporting member attains a position behind the center of the connection point between the wiper arm and the wiper blade. Additionally, it has been shown that the ends of the supporting member constructed according to this characteristic feature do not have a detrimental effect on the wiping quality.

To avoid troublesome corners on the supporting member, the narrowing of the width of the supporting member is continuous.

According to a modification of the first embodiment of the wiper blade according to the invention, the supporting member is divided longitudinally, with the resulting two rails of the supporting member lying in longitudinal grooves on the sides of the wiping strip, and the device for connecting the wiper blade being located on sections of the supporting member rails that jut out of the longitudinal grooves. Thus, it is also possible to make use of the advantages of the invention in cases when particular reasons dictate that a longitudinally divided supporting member will be used.

In another embodiment of the wiper blade according to the invention, the supporting member is divided laterally in its middle section and the resulting two parts of the supporting member can each pivot, relative to the connection device for the wiper arm, on a respective axle arranged perpendicular to the window. This measure gives the wiper blade a top view that, in accordance with the wiping direction, has an alternating V-shape, so that the straight line passing through both end sections of the ends of the supporting member moves against the respective wiping direction into a position behind the center of the connection point between the wiper arm and the wiper blade.

A low-clearance wiper blade of this type is achieved if each of the supporting member parts has its own assigned pivoting axle.

In certain implementations it can also be useful if the two supporting member parts overlap with an extension and have a shared pivoting axle assigned to both of them in the area of the overlap.

For technical manufacturing reasons it is advantageous if the thickness of the supporting member parts is constant along their entire lengths.

To attain a particular desired distribution of the contact pressure over the length of the wiper blade, the width, measured in the wiping direction, of the supporting member parts is smaller at their end areas than at their middle areas; and the advantages mentioned above result if the narrowing of the supporting member parts is continuous.

In order to avoid an excessive reduction in size of the wiping field, the pivoting motion of the supporting member parts in their reversal positions is limited by stops.

Further advantageous developments and embodiments of the invention are given in the following description of the embodiment examples depicted in the accompanying illustration.

Illustration

The illustration shows: Figure 1, a first embodiment of a wiper blade according to the invention in perspective; Figures 2 through 4, enlarged cross-sections of the wiper blade according to Figure 1, along the line II-II, where the wiper blade is in a different operating position in each one; Figure 5, a top view of a supporting member belonging to a wiper blade according to Figure 1, representing its shape when the wiper blade is in a neutral position; Figure 6, the shape of the supporting member according to Figure 5 when the wiper blade is wiping to the right; Figure 7, the shape of the supporting member according to Figure 5 when the wiper blade is wiping to the left; Figure 8, a top view of another embodiment of the supporting member when the wiper blade is in a neutral position; Figure 9, the shape of the supporting member according to Figure 8 when the wiper blade is wiping to the right; Figure 10, the shape of the supporting member according to Figure 8 when the wiper blade is wiping to the left; Figure 11, another embodiment [of the] supporting member according to Figure 8 in perspective; Figure 12, an enlarged cross-section view of the wiper blade cut along the line XII-XII in Figure 1; Figure 13, a cross-section as in Figure 12 of a wiper blade according to the invention in which, however, the supporting member is longitudinally divided; and Figure 14, a top view of the supporting member according to Figure 13 in which the connection device for the wiper arm and the wiping strip is represented by dotted and dashed lines.

Descriptions of the embodiment examples

Shown in perspective in Figure 1, a wiper blade 10 for cleaning motor vehicle windows has a band-shaped, long, flexibly elastic supporting member 30, which is made of spring steel in the embodiment. This supporting member 30 can, however, also be made of another material, for example, a synthetic material that has the characteristics necessary to fulfill the purpose of the supporting member 30. On the flat side of the supporting member 30 which faces the window 24 there is attached a wiping strip 17 with its wiping strip body 16, on the side of which that faces the window 24 there is, connected by a narrow flexing strip 14, a wiping lip 18 which can be laid against the window 24. The long wiping strip 17 has an essentially equal cross-section along its entire length, which approximately corresponds to the length of the supporting member 30. The wiping strip 17 is oriented to the supporting member 30 in such a way that the respective longitudinal axes of these assembly pieces are parallel. On the flat side of the supporting member 30 that is facing away from the window 24, there is fastened a device 32 for the attachment of a pivoting powered wiper arm 34. The free end of a wiper arm 34 attaches in a generally known way to a hinge bolt 36 of the connection device 32. The wiper arm 34 is pressed against the window 24 to be wiped by contact pressure (arrow 22). In the embodiment example the wiper blade is moved back and forth perpendicular to its longitudinal axis with the aid of the wiper arm. In this back and forth motion, represented in Figure 1 by the double arrow 12, 26, the supporting member 30 moves in a plane that is essentially parallel to the surface of the window. The described construction of the long wiper blade – with the exception of the connection device 32 – can be inferred particularly clearly from Figure 2, already described at the beginning. The top view shown in Figure 5 of the supporting member 30 of the wiper blade 10 shows that a straight line 38 passing through the longitudinal center of the two ends of the wiper blade also passes through the center 40 of the connection point between wiper arm and wiper blade. This center 40 lies, with reference to Figure 1, on the hinge bolt 36 in its middle section. The configuration of the supporting member 30 shown in Figure 5 results when the wiper blade is lifted from the window and set back down upon the window 24 without directional powered motion. Figure 5 also shows that the width of the supporting member 30, measured in the wiping direction (double arrow 12, 26), is smaller at its end sections or end areas 43 than at its middle area 44. This described narrowing of the supporting member toward its ends is continuous. It can be calculated such that the width 42 of the supporting member end areas 43 is narrower than the width of the wiping strip body 16 (Figure 12). The thickness 46 of the supporting member 30 is constant over its entire length, at least in a supporting member 30 made of spring steel. The described narrowing is carried out such that the two end sections 43 of the supporting member 30 are flexibly deflectable in the wiping direction (double arrow 12, 26). The deflection, which is given the reference number 48 in Figures 6 and 7 and is greater than 1 millimeter, is achieved by

the strip 17, which is laid against the window by the contact pressure (arrow 22). The working motion of the wiper blade is transferred directly to the wiping strip 17 in the rigid middle area of the supporting member, while in the comparatively pliant end sections 43 of the supporting member 30 a so-called dragging tension first must be built up, that must be greater than the friction between wiping lip 18 and window 24. The result of this is that, depending on and relative to the respective wiping direction (arrow 12 in Figure 7 or arrow 26 in Figure 6), the straight line 38 passing through the longitudinal center of both ends 43 of the wiper blade lies behind the center 40 of the connection point between the wiper arm 34 and the wiper blade 10, offset by the distance 48.

Another embodiment of the wiper blade according to the invention is schematically given in Figures 8 through 10. They show operating positions comparable to Figures 5 through 7 of the wiper blade supporting member. In this embodiment, however, the supporting member 130 is laterally divided and as such has two supporting member parts 132, 134. The facing ends of the supporting member parts 132, 134 lie a small distance 136 apart. They are both connected to the wiper arm connection device 142, shown by a dashed and dotted line in Figure 8, at their facing ends, each by means of a respectively assigned joint 138, 140. The axles of the joints 138, 140 are arranged perpendicular to the window. The center 40 of the connection point between wiper arm and wiper blade is located in the area of the gap 136 when the wiper blade is in neutral position. The size of the gap 136 is calculated such that the two free outside ends of the two supporting member parts 132, 134 can perform a deflected motion corresponding to deflection 48 (Figures 6 and 7), which makes it possible that, during the operation of the wiper blade, depending on the wiping direction (arrow 12 or arrow 26), a straight line 38 passing through both ends of the wiper blade lies behind the center 40 of the connection point between wiper arm and wiper blade, relative to the respective wiping direction 12 or 26.

The measure of this offset is given in Figures 9 and 10 by the reference number 144. The deflection 144 is produced during the wiping operation by the circumstances already mentioned in reference to Figures 5 through 7. A limiting of the deflection results from a corresponding sizing of the gap 136, because the facing ends of the supporting member parts 132, 134 prop themselves against each other.

Figure 11 shows a further embodiment of the wiper blade according to the invention, similar to the just described embodiment. In a deviation from the construction according to Figures 8 through 10, here the two supporting member parts 150, 152 each have an extension 154, 156, [both of] which overlap at the ends that face toward each other. In this overlap area 158 there is a common joint 160, assigned to both supporting member parts 151, 152 [sic; 150,152], which allows a limited swinging motion (double arrow 162) for both of the supporting member parts 151, 152. During the wiping operation, the behavior of the supporting member

according to Figure 11 essentially corresponds to the behavior of the supporting member according to
Figures 8 through 10, because here, too, the two supporting member parts 150, 152 can pivot (double arrows 162) in relation to the connection device 164 schematically indicated by a dashed and dotted line, by means of the common joint 160.

In certain implementations it can be advantageous if the supporting member is longitudinally divided as shown in Figures 13 and 14. This results in two supporting member rails 172 and 174 that constitute a single supporting member. The rails lie in longitudinal grooves 176, 178 that are located on the side of the wiping strip body 180 (Figure 13) and that are open to the longitudinal outside and essentially parallel to one another.

A top view of such a longitudinally divided supporting member 170 is shown in Figure 14, not to scale, in which in Figure 14 the position of the wiping strip 182 as well as the position of the connection device 184 are indicated by a dashed and dotted line. With the exception of this longitudinal division and the arrangement of the two supporting member rails 172, 174 in the longitudinal grooves of the wiping strip, the wiper blade 186 according to Figures 13 and 14 corresponds in [sic; to] the wiper blade according to Figure 1 with the one-piece supporting member according to Figures 5 through 7 and 12. It can be seen that although the supporting member rails 172, 174 lie a distance apart, in their totality they fully correspond to the supporting member 30 according to Figures 1, 5 through 7 and 12. Thus, during the wiping operation the supporting member ends can also be deflected in one of the two directions given by the double arrows 188 according to the wiping direction, so that a straight line passing through the common longitudinal center of both ends of the wiper blade in a respective wiping direction will lie behind the center 190 of the connection point between wiper arm and wiper blade. In this embodiment of the wiper blade the device for connecting the wiper blade to the wiper arm is located on the middle sections of the supporting member rails 172, 174 that jut out of the longitudinal grooves 176, 178.

By means of these concrete measures which have been described as embodiment examples with reference to Figures 5 to 7, 9 to 11 and 12, 13, it is made possible that in each of the two swing directions 12, 26, seen perpendicularly to the window, a straight line 38 through the longitudinal center of both ends 43 of the wiper blade 10 lies, in the respective wiping direction, behind the center 40 of the point of connection between wiper arm and wiper blade. Expressed in a different way, during the wiping operation the wiper blade can be deformed essentially within the plane lying parallel to the window surface in such a way that, in the respective wiping direction 12, 26, its two ends 43 are behind the center 40 of the connection joint between wiper blade connection device 32 and wiper arm 34. This achieves, starting from

the middle of the wiper blade, a gradual, continuous turnover of the wiping lip 18 from the one to the other of its dragging positions, so that annoying noises are avoided.

The following-behind action of one or both of the supporting member ends, seen relative to the wiping direction and relative to the connection point for the wiper arm, is caused in wiper blades like the embodiment examples described herein by a holding force that acts on the supporting member opposite the wiping direction due to the contact pressure of the wiping strip against the window and the friction that results during the wiping operation. The deflection can, however, also be caused actively by elements attached to or contained within the supporting member--catch springs, for example.

Claims

1. A wiper blade for cleaning motor vehicle windows with a band-shaped, long, flexibly elastic supporting member (30), on one flat side of which-the side facing away from the window (24)–there is a device (32) for connecting a powered wiper arm (34) that swings back and forth, and on the [other] flat side of which – the side facing toward the window - there is a long rubbery-elastic wiping strip (17) that is parallel to the longitudinal axis of the supporting member and can be laid against the window, and, during the wiping operation, the wiper arm moves the wiper blade perpendicular to its longitudinal axis, in the course of which the supporting member moves in a plane that is essentially parallel to the window surface, characterized by the fact that, in each of the two swing directions (12, 26), seen perpendicularly to the window surface, a straight line (38) through the longitudinal center of both ends of the wiper blade lies, in the respective wiping direction, behind the center (40) of the point of connection between the wiper arm (34) and the wiper blade (10).

2. A wiper blade as in Claim 1, characterized by the fact that the distance (48 or 144) from the straight line (38) to the center (40) of the connection point is greater than 1 mm.

3. A wiper blade as in one of Claims 1 or 2, characterized by the fact that the thickness of the supporting member (30, 130, 170) is constant along its entire length.

4. A wiper blade as in one of Claims 1 to 3, characterized by the fact that, measured in the wiping direction, the width of the supporting member (30, 130, 170) is smaller at its end areas (43) than at its middle area (44).

5. A wiper blade as in Claim 4, characterized by the fact that the narrowing of the width of the supporting member is continuous.

6. A wiper blade as in one of Claims 1 to 5, characterized by the fact that the supporting member (170) is longitudinally divided, so that the resulting two supporting member rails (172, 174) lie in longitudinal grooves (176, 178) in the sides of the wiping strip (182), and the device

for connecting the wiper arm is located on sections of the supporting member rails (172, 174) that jut out of the longitudinal grooves.

7. A wiper blade as in one of Claims 1 to 5, characterized by the fact that the supporting member (130) is laterally divided in its middle section and that the two supporting member parts (132, 134) can each pivot, relative to the connection device (142) for the wiper arm, on a respective axle arranged perpendicular to the window.

8. A wiper blade as in Claim 7, characterized by the fact that each of the parts (132, 134) of the supporting member has a pivoting axle, which is assigned to it.

9. A wiper blade as in Claim 7, characterized by the fact that the two parts (150, 152) of the supporting member overlap each other with an extension (154, 156) and have, in the extension area (158), a common pivoting axle (160) assigned to both of the supporting member parts.

10. A wiper blade as in one of Claims 7 to 9, characterized by the fact that the pivoting motion of the parts (132, 134 or 150, 152) of the supporting member in their reversal positions is limited by stops.

11. A wiper blade for cleaning motor vehicle windows with a band-shaped, long, flexibly elastic supporting member (30), on one flat side of which-the side facing away from the window (24) – there is a device (32) for connecting a powered wiper arm (34) that swings back and forth, and on the [other] flat side of which – the side facing toward the window-there is a long rubbery-elastic wiping strip (17) that is parallel to the longitudinal axis of the supporting member and can be laid against the window, and, during the wiping operation, the wiper arm moves the wiper blade perpendicular to its longitudinal axis, in the course of which the supporting member moves in a plane that is essentially parallel to the window surface, characterized by the fact that during the reversal of the direction of swing, at least one end of the wiper blade stays behind relative to the wiping motion until the turnover of the wiping strip (17) into the new dragging position has begun at at least one point.

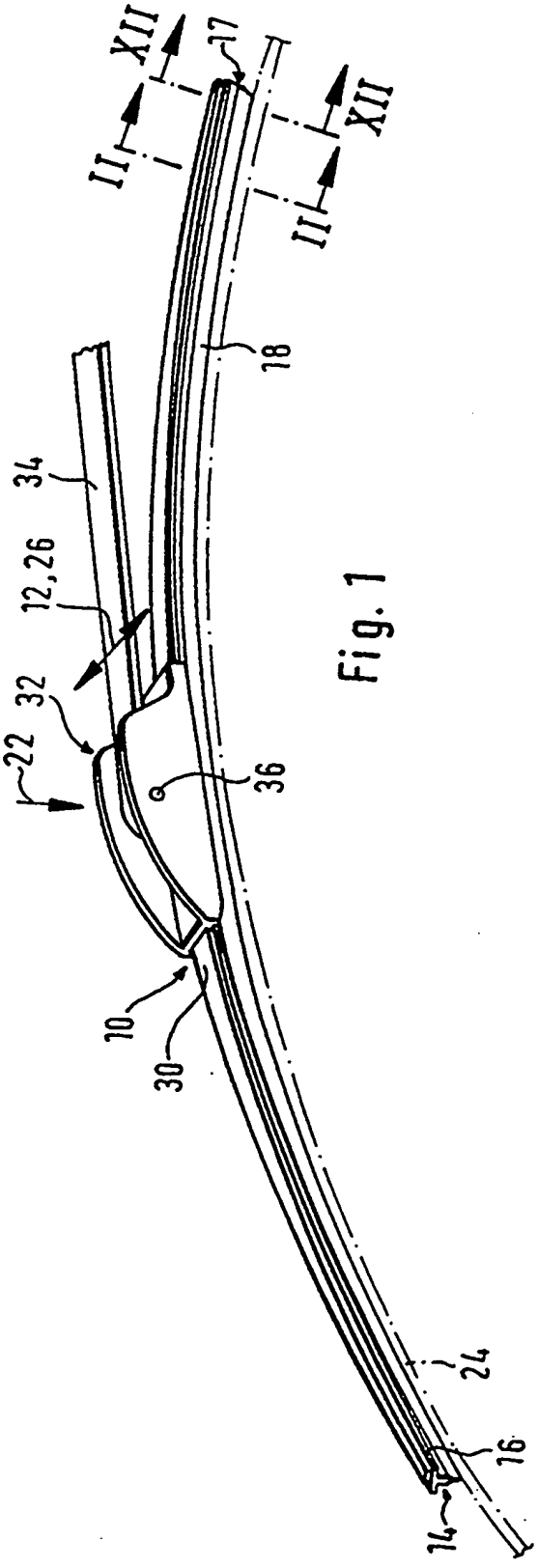


Fig. 1

Fig. 3

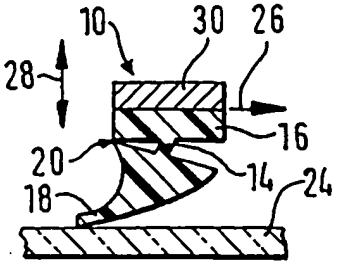


Fig. 2

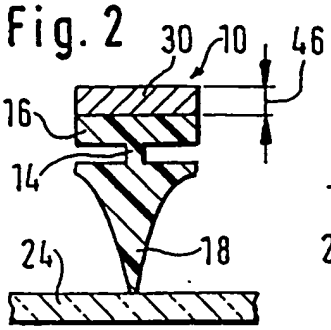
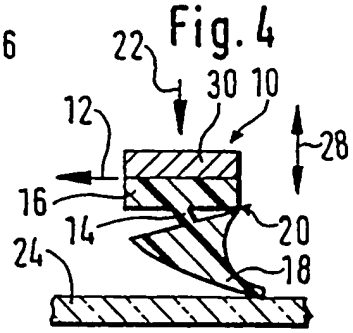


Fig. 4



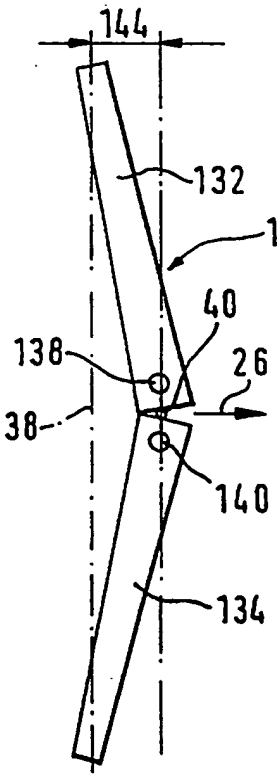


Fig. 9

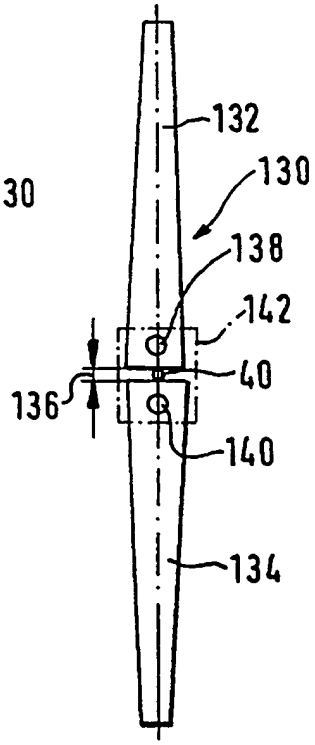


Fig. 8

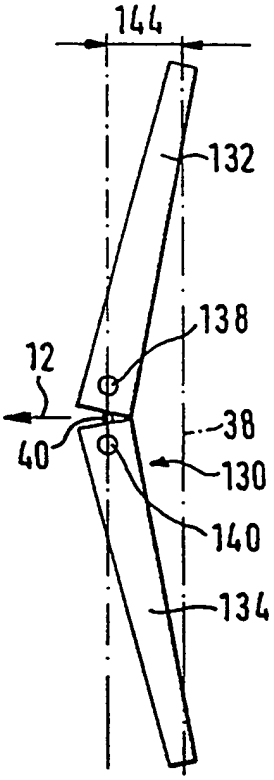


Fig. 10

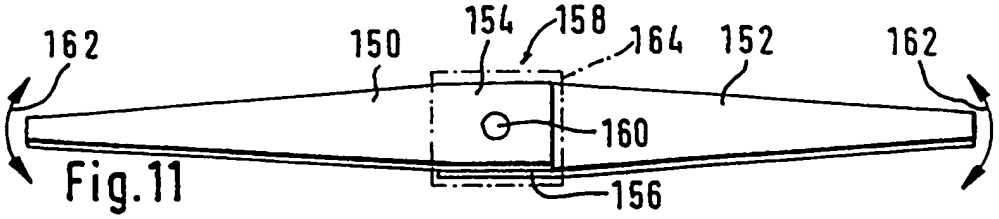


Fig.11

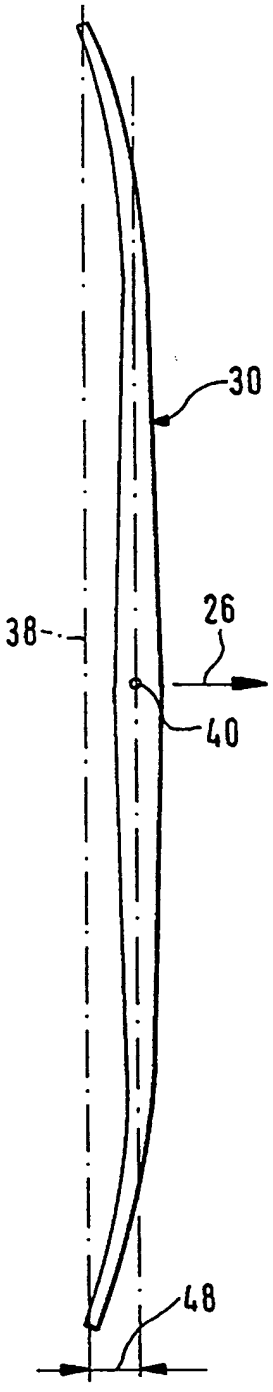


Fig. 6

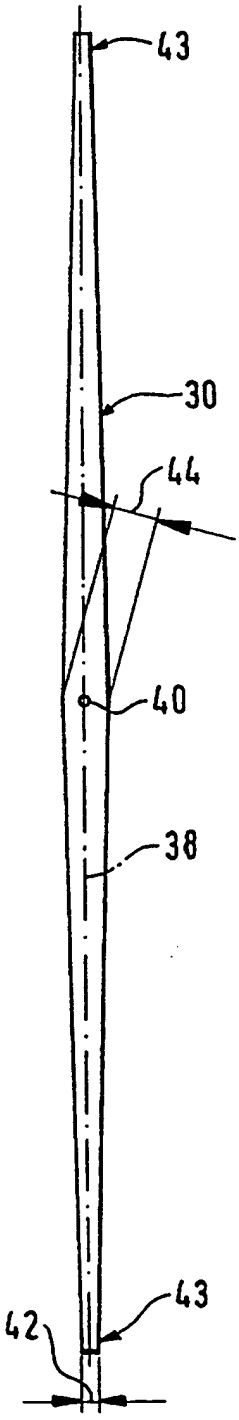


Fig. 5

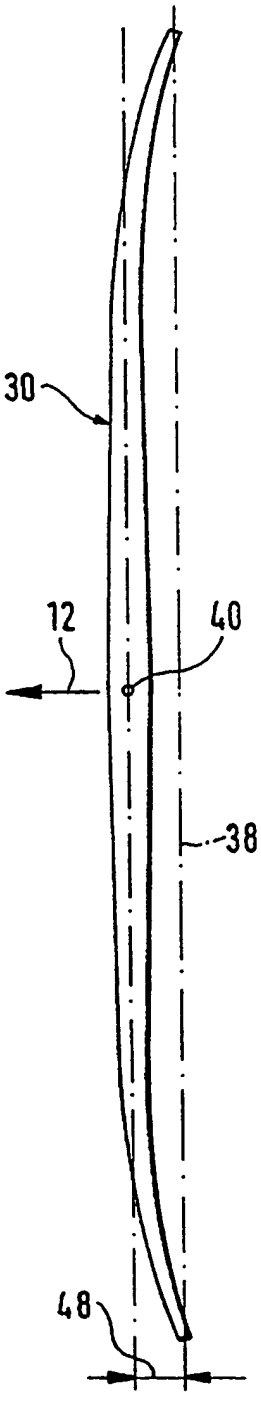


Fig. 7

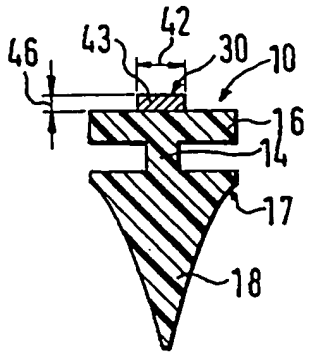


Fig. 12

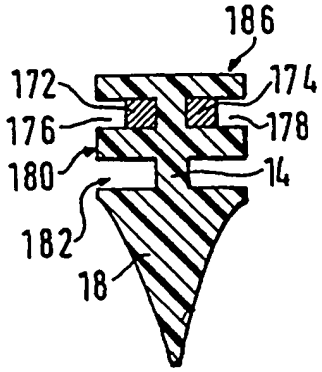


Fig. 13

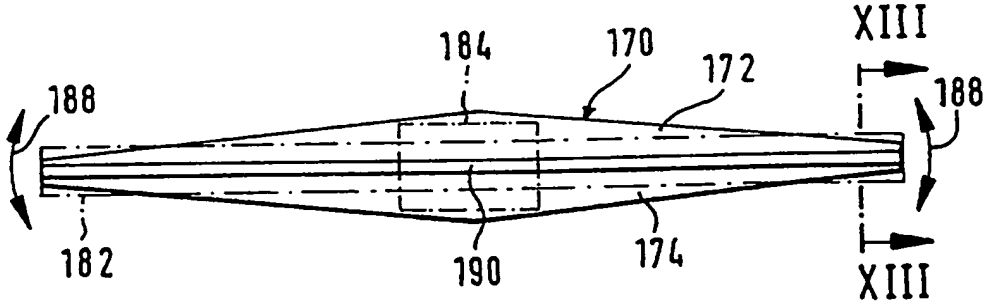


Fig. 14